



STUDENT MANUAL
DEFENSE SUPPORT BASIC SAR TRAINING
MODULE 0
WELCOME AND INTRODUCTIONS

Course Objective

Upon completion of this course students will have a greater understanding of the policies, procedures and concept of operation to conduct civil Search and Rescue (SAR) missions. Successful participants will increase their knowledge and abilities to operate safely and effectively during Defense Support of Civil Authorities disaster SAR missions.

Course Enabling Objectives

Successful participants will:

- Be provided an overview of the National Urban Search & Rescue Response System and disaster operations
- Understand Federal, State and Local laws, policies and procedures that address rules of engagement including forced entry procedures.
- Understand the US National Grid and other geo-reference data used to mark locations.
- Understand the standard types of searches, search strategies and search marking systems used by SAR professionals.
- Understand the hazards associated with disaster SAR operations and the personal protective equipment required for personal protection.



I. Welcome and Introductions

Welcome

The lead FEMA and/or DoD representative will present opening remarks and introduce any local hosts and/or guests who may be present.

Introductions

The FEMA representative will introduce the training cadre and the instructors(s) will note their backgrounds and experiences.

Facility Orientation

- Security
- Housekeeping issues
- Food and refreshments
- Restrooms

Course Requirements / Ground Rules

- Total course time is not more than two hours
- Attendance is mandatory at all sessions
- There will not be any scheduled breaks
- The use of pagers and cell phones is restricted
- Sidebar conversations are to be kept to a minimum



II. Course Information

Course Objective

Upon completion of this course students will have a greater understanding of the policies, procedures and concept of operations to conduct civil SAR missions. Successful participants will increase their knowledge and abilities to operate safely and effectively during Defense Support of Civil Authorities disaster SAR missions.

Course Enabling Objectives

- Understand Disaster Operations and the National US&R Response System
- Understand Federal, State and Local Rules of Engagement
- Be familiar with the Catastrophic Incident SAR supplement of the National SAR Plan
- Understand the US National Grid and other geo-referencing systems used by civil SAR professionals
- Understand types of searches, search strategies and search marking systems used by civil SAR professionals
- Understand the hazards of SAR operations and the PPE necessary for personal protection

Course Design

This course is a lecture and facilitated discussion course of instruction. The course instructor will present specific information and facilitate discussion of critical learning points. Participants are encouraged to engage in the technical discussions.

Course Evaluation

Participants will be asked to fill out a short end of course evaluation that is meant to ensure course delivery improvements.

Student Manual

This student manual includes in each unit:

- Slide note handouts;
- End-of-course evaluation



III. Course Schedule Defense Support Basic SAR Training

Time	Run Time	Unit	Instructor
8:00-8:03	3 Minutes	Mod 0: Welcome and Introductions	
8:03-8:18	15 Minutes	Mod 1 Unit 1: Overview of US&R System	
8:18-8:28	10 Minutes	Mod 1 Unit 2: Rules of Engagement	
8:28-8:33	5 Minutes	Mod 1 Unit 3: Catastrophic Incident SAR	
8:33- 8:53	20 Minutes	Mod 2 Unit 1: US National Grid	
8:53-9:08	15 Minutes	Mod 2 Unit 2: Search Definitions	
9:08-9:28	20 Minutes	Mod 2 Unit 3: Search Marking Systems	
9:28-9:43	15 Minutes	Mod 3 Unit 1: Hazards	
9:43-9:58	15 Minutes	Mod 3 Unit 2: Hazard Mitigation / PPE	
9:58-10:00	2 Minutes	Course Summary	

IV. Unit Summary

The Defense Support Basic SAR course will be a exciting and challenging course. The best learning experience is when you actively participate. The survivors of any large scale disaster you may respond to thank you very much for your dedication to our great country and the sacrifices you make to ensure our freedom and safety.



STUDENT MANUAL

DEFENSE SUPPORT BASIC SAR TRAINING

MODULE 1

UNIT 1: FEMA NATIONAL URBAN SEARCH & RESCUE RESPONSE SYSTEM

Unit Objective

Upon completion of this unit, participants will have a basic understanding of the FEMA National Urban Search & Rescue Response System.

Enabling Objectives

Successful participants will understand the FEMA National Urban Search & Rescue Response System including:

- Task force capabilities
- Incident Support Team capabilities
- The FEMA US&R response history



I. Objectives

Unit Objective

Upon completion of this unit, participants will have a basic understanding of the FEMA National Urban Search & Rescue Response System.

Enabling Objectives

Understand the FEMA National Urban Search & Rescue Response System including:

- Task force capabilities
- Incident Support Team capabilities
- The FEMA US&R response history

II. FEMA National Urban Search & Rescue (US&R) Response System

INTRODUCTION

The National Urban Search and Rescue (US&R) Response System, established under the authority of the Federal Emergency Management Agency in 1989, is a framework for structuring local emergency services personnel into integrated disaster response task forces. These task forces, complete with the necessary tools and equipment, and requisite skills and techniques, are deployed by FEMA for the rescue of victims of structural collapse.

When the federal government mobilizes resources and conducts activities to support state and local response to disasters, it does so under 15 Emergency Support Functions (ESFs). ESF-9, Search and Rescue (SAR), is lead by a primary agency based on the nature of the event, and its authorities, resources and capabilities in a particular functional area.

FEMA is the primary agency for Urban Search and Rescue (US&R). The U.S. Coast Guard has the primary role for incidents involving maritime SAR. The Department of Interior/ National Park Service and the Department of Defense/US Air Force share the primary role in wide area land SAR.

US&R resources may be activated or placed on alert when a major disaster threatens or strikes a community. Each US&R task force is responsible for deploying its personnel and equipment within six hours of activation. The task force travels to the disaster site by ground or air in a matter of hours.



OVERVIEW

Currently, there are 28 FEMA US&R Task Forces strategically located throughout the continental United States. They are comprised of local fire and emergency services personnel and civilian volunteers from nineteen states. Each US&R Task Force can be configured as either a Type I or a Type III. Their complement is geared toward the nature of the disaster.

A Type I US&R task force is comprised of 70 members and capable of performing heavy rescue on large concrete structural collapse incidents. Type III US&R task forces are configured for lighter construction usually encountered in weather related natural disasters. Both types are organized into four major functional elements: search, rescue, technical and medical.

Task force members include structural engineers and specialists in the areas of hazardous materials, heavy rigging, search (including highly trained search dogs), logistics, rescue and medicine. Two task force members are assigned to each position to allow rotation and relief of personnel to permit round-the-clock operations.

Each Type I task force is supported by a comprehensive 70,000 pound equipment cache. The cache includes: communications, locating, rigging, hauling, lifting and pulling equipment. Tools and equipment for shoring, structural movement sensing, survivor extrication, cutting and drilling are also included.

Task Force Capabilities

- Physical search and rescue operations in damaged/collapsed structures
- Emergency medical care for entrapped victims, task force personnel and search canines
- Reconnaissance to assess damage and needs and provide feedback to local, state and Federal officials
- Assessment/shut off of utilities to houses and other buildings
- Hazardous materials survey/evaluations
- Structural/hazard evaluations of buildings needed for immediate occupancy to support disaster relief operations
- Stabilizing damaged structures, including shoring and cribbing operations on damaged buildings



US&R Incident Support Team Capabilities

The National US&R Incident Support Team (IST) provides a group of highly qualified specialists readily available for rapid assembly and deployment to a disaster area. The IST furnishes Federal, State, tribal and local officials with technical assistance in acquiring and using US&R resources. It provides advice, Incident Command assistance, management, and coordination of US&R Task Forces, and US&R logistics support. There are three rostered IST-A teams in the National US&R Response System.

The IST is organized according to basic Incident Command System (ICS) guidelines, with an IST Command and Command Staff and Operations, Planning, Logistics, and Finance and Administration Sections. The Advance Element of an IST (IST-A) consists of 35 positions.

National US&R Training Courses

Eleven FEMA US&R national training courses are offered each year to the System. Two members from each of the 28 Task Forces attend each course. All course work is developed and delivered by FEMA US&R subject matter experts.

The National Course Curriculum includes:

- ESF-9 / Incident Support Team
- Task Force Leader
- Canine Search Specialist
- Technical Search Specialist
- Heavy Equipment & Rigging Specialist
- Structural Collapse Technician Train-the-Trainer
- Medical Specialist
- Logistics Specialist
- Communications Specialist
- Planning Team
- Safety Officer



Local Task Force Training Courses

FEMA US&R training courses are also offered to System members at the local task force level. This course work is also developed at the national level and delivered by FEMA US&R subject matter experts. These standardized courses are delivered at each task force location.

All System members receive this training:

- Orientation
- Incident Command System
- First Aid / CPR
- WMD Enhanced Operations
- WMD Medical Considerations
- WMD Hazardous Materials Considerations
- US Air Force Hazardous Materials Certification
- Water Operations Awareness
- Structural Collapse Technician

Operational Readiness Evaluations

In order to verify task force operational readiness, FEMA US&R conducts on-site peer evaluations. This is a three-year process involving 10 task forces each year. Sixteen elements are reviewed in three different areas: management, logistics and operations.

During 2009, eleven evaluations were conducted. The evaluator cadre is made up of a combination of Program Office staff and task force peers. The evaluations are a hands on process which thoroughly examine all three areas to make a determination of readiness, assist in corrective actions and capture best practices for use by others in the System.

FEMA US&R Program Benefits

The FEMA National US&R Response System results in a significant benefit to a National SAR response. The standardization developed in order to operate the System has resulted in the development of concise operational procedures and position-specific National Training Curriculum.

The ability to deploy Incident Support Teams for US&R overhead management/Incident Command Post support has also expanded to include other SAR responders on large events.

Additionally, all elements of the FEMA National US&R Response System are shared with other Federal, State, and local teams fostering further standardization and better coordination.



III. FEMA US&R Response History

Detailed Activation Process

The US&R Program Office uses a detailed activation process to facilitate immediate activation and response. The system uses a combination of geographically “closest forces” and an annual rotational matrix to determine the order in which task forces are activated.

Once the task forces to be utilized for a response are identified, activation orders are issued by the US&R Program Office. The task forces then have a specific amount of time to be enroute to the event reporting location: four hours if traveling by ground or six hours if traveling by air.

Recent FEMA USR& responses include:

- 2001 – 25 Task Forces activated in response to the Pentagon and World Trade Center attacks
- 2002 – 11 Task Forces for the Winter Olympics Standby
- 2003 – 19 Task Forces for the Columbia Space Shuttle, Hurricane Isabel, and the December Threat Level Orange Alert
- 2004 – 22 Task Forces for the G-8 Summit, Democratic National Convention, Republican National Convention, and Hurricanes Charley, Frances, Ivan, & Jeanne
- 2005 – All 28 Task Force for Hurricanes Dennis, Emily, Katrina, Ophelia, Rita, and Wilma (77 total activations)
- 2006 – 14 Task Forces for Hurricane Ernesto
- 2007 – 4 Task Forces for the Greensburg, KS tornado, Tropical Storm Dennis
- 2008 – 24 Task Forces for the 2008 Republican National Convention and Hurricanes Gustav, Hannah, Ike & Omar
- 2009 – 4 Task Forces for the 2009 Presidential Inauguration and North Dakota Flood

Excluding Katrina, this is an average of 18 task forces activated each year from 2001 to 2008.

IV. Conclusion

The National Urban Search and Rescue (US&R) Response System structures local emergency services personnel into 28 integrated disaster response task forces strategically located throughout the continental United States. These task forces, complete with the necessary tools and equipment, are deployed by FEMA for the rescue of survivors of structural collapse. Comprised of local fire and emergency services personnel and civilian volunteers, they are capable of performing heavy rescue on large concrete structural collapse incidents. The standardization developed in order to operate the System has resulted in the development of concise operational procedures and position-specific National Training Curriculum.



STUDENT MANUAL

DEFENSE SUPPORT BASIC SAR TRAINING

MODULE 1

UNIT 2: RULES OF ENGAGEMENT

Unit Objective

Upon completion of this unit, participants will be able to understand basic protocols for engaging in search and rescue operations.

Enabling Objectives

Successful participants will understand several issues related to the rules of engagement;

- Local Protocols
- Search and Rescue Protocols
- Victim Medical Care
- Handling Human Remains



I. Objectives

Unit Objective

Upon completion of this unit, participants will be able to understand basic protocols for engaging in search and rescue operations.

Enabling Objectives

Successful participants will understand several issues related to the rules of engagement;

- Local Protocols
- Search and Rescue Protocols
- Victim Medical Care
- Handling Human Remains

II. Local Protocols

The primary objective of disaster response search and rescue operations is to locate, extricate, treat and transport victims. The rules of how outside resources get to the scene and accomplish that mission vary, based on State, tribal or local government rules and protocols. It is important for outside responders to quickly learn and adhere to local policies and protocols governing their operation, this would include search and rescue procedures, reporting requirements, medical intervention, and the disposition of human remains.

The authorities with responsibility for dealing with the disaster are referred to as the Authority Having Jurisdiction (AHJ). In some cases, the AHJ (i.e., mayor, city manager, parish president, county judge or supervisor, tribal chief, etc.) may specifically request outside resources (e.g., cranes, buses or a state US&R team) from a nearby state. Additionally, a state governor has options to assist the disaster area. The governor may deploy needed assets from throughout the state (often managed through the State Emergency Management Organization) including the National Guard. After issuing a State Declaration of Disaster, he/she may also request assistance through EMAC and request a Presidential Declaration of Disaster.

There are numerous ways in which outside resources may respond to a disaster, some are legal and properly authorized by some governing body, others may not be. Appropriate ways through which resources will respond include Automatic Aid Agreements (AAA) and Mutual-Aid Agreements (MAA), by specific request or order of the Authority having Jurisdiction (AHJ), the Emergency Management Assistance Compact (EMAC) or the National Response Framework (NRF). When resources are requested and respond properly, the recipient jurisdiction knows the responding resource has the appropriate personnel, tools



and equipment, capabilities, skill sets, and credentials to perform the job safely and effectively.

- 1 Automatic Aid Agreements (AAA) – Neighboring jurisdictions often have agreements whereby Law, Fire and/or EMS resources will automatically respond across jurisdictional borders. Those agreements are normally documented and in place, prior to a disaster occurring.
- 2 Mutual Aid Agreements (MAA) – Most jurisdictions have signed Mutual-Aid Agreements, normally for public safety organizations, by which specific response assets in close proximity or throughout the State may be requested when local resources are overwhelmed.
- 3 Emergency Management Assistance Compact (EMAC) – The Compact was developed by the National Association of Emergency Managers and approved by Congress. It is the mechanism by which resources in one state can be shared with another in time of need. All 50-states and a number of US Territories are signatories to the EMAC.
- 4 National Response Framework (NRF) – Once the President declares a Disaster and invokes the Stafford Act, the National Response Framework becomes the mechanism by which the Federal Government extends assistance to the disaster area. The NRF is managed through 16-Emergency Support Functions providing personnel, equipment and commodities where needed. Authorized resources respond to specified reporting locations, report in appropriately and come under the command and control of the local incident management organization.

There are also situations where outside resources do not follow established protocols and respond without being requested, often becoming a burden to local authorities. Well intentioned responders may self-dispatch to a disaster site and offer assistance or just go to work. While they may be welcomed in the initial chaotic stages of the incident, there are inherent legal and liability issues if they were not officially requested by the AHJ. Others, some with valid credentials, others who were imposters, have responded to incidents with their own hidden agendas, some for personal notoriety or self aggrandizement and others with more sinister motives such as the looting of vacated areas.

It is because of the negative element that some AHJ have very tight rules governing outside resources operating in their jurisdiction. Any outside resource, responding to a disaster site should check-in properly with the local authorities. That may be a governmental authority, someone at an emergency operations center (EOC), the public safety person in-charge, or an Incident Management Team (IMT). If an incident management organization has been established, outside resources will work within that framework, if not there may be a requirement that a local authority be attached as a liaison. Either way, responding resources should never work without direction from the local authorities (“freelance”).

III. Search and Rescue Protocols

Outside resources responding to a disaster situation might expect to be working under an IMT, a fire officer, law enforcement officer, emergency manager, or even a political or tribal



official. However, many states have delegated search and rescue responsibilities to agencies such as the Department of “Fish and Wildlife”. Every state will have an ESF-9 coordinator that is responsible for search and rescue functions. It is important for outside responders to understand to whom they report and adhere to local policies and protocols governing their operation. While we strive for consistency, the rules of engagement will be different at each disaster and each location based on a variety of factors including local customs and cultures, and emotional and political influences. Local authorities often establish ad-hoc rules governing access to structures during the disaster. Those influences may also cause the definitions of terms such as “Hasty Search” to be modified to meet the needs of the AHJ. Protocols may limit when and how structures may be entered, when forced entry may be permissible or required, and where and how search markings are applied.

III. Victim Medical Care

The medical treatment of injured victims of a disaster will vary based on the location, damage to the infrastructure, size and scope of the disaster, time utilized to locate and extricate the victim and availability of definitive medical care. Search and rescue personnel will normally provide initial intervention during the extrication process, as needed and as possible. Once the victim has been extricated, he/she should be transferred to the nearest appropriate medical authority for the best treatment available at that time. Ideally, that would be a trauma center or receiving hospital but it may be to a designated casualty collection point or to a Disaster Medical Assistance Team (DMAT). Once medical care has been initiated, local protocols will dictate appropriate documentation that should accompany the victim. In addition to required medical treatment documents, responders should maintain a log of every victim with whom they made contact, including name, location of contact, age, address and telephone number, date of birth, and chief complaint.

IV. Handling Human Remains

One of the difficulties of disaster response operations is the recovery and handling of human remains. Most jurisdictions should have established laws, policies and procedures for managing human remains, during and after a large scale disaster, but many may not. In that case the AHJ or IC will determine the protocols for extrication and disposition of remains. In some locations only an official representative of the local Medical Examiner’s (ME) office is authorized to handle the remains, but in other locations it may be law enforcement or other personnel. Sometimes, the ME will just document the location of the remains and not be directly involved with them after that. In some situations private third party contractors have been utilized for the collection and appropriate disposition of the remains because local personnel and facilities were overwhelmed.

Beyond the legal requirements, there may also be cultural, political and emotional influences involved in dealing with human remains. Outside rescue personnel may be requested to assist with the recovery to ensure the safety of those involved as well as the respectful recovery and transfer of the remains, and very often, local personnel will want to remove the



remains from a site after outside responders have extricated them.

V. Conclusion

When outside resources respond to a disaster, there are specific rules of engagement by which they must abide. There are protocols for requesting outside resources and for operational functions such as Search and Rescue, Victim Medical Care and Handling Human Remains. Whatever the rules are, outside personnel must understand them, adhere to them, and respect them.



STUDENT MANUAL

DEFENSE SUPPORT BASIC SAR TRAINING

MODULE 1

UNIT 3: CATASTROPHIC SEARCH & RESCUE ADDENDUM

Unit Objective

Upon completion of this unit, participants will understand the U.S. National SAR System, the National Search and Rescue Committee and the Catastrophic Incident SAR Addendum.

Enabling Objectives

Successful participants will:

- Understand the National SAR System and the National SAR Committee (NSARC)
- Understand the purpose of the Catastrophic Incident SAR (CISAR) Addendum



III. Objectives

Unit Objective

Upon completion of this unit, participants will understand the U.S. National SAR System, the National Search and Rescue Committee and the Catastrophic Incident SAR Addendum.

Enabling Objectives

Successful participants will:

- Understand the National SAR System and the National SAR Committee (NSARC)
- Understand the purpose of the Catastrophic Incident SAR (CISAR) Addendum

IV. U.S. Nation SAR System & National Search and Rescue Committee

OVERVIEW

U.S. Nation Search and Rescue System

The world is divided into Search and Rescue Regions (SRRs) by international convention. Aeronautical SRRs were established first, followed by maritime in 1979 (though “provisional” lines were not completed until 1998).

U.S. SAR Responsibilities:

The U.S. Coast Guard is responsible for maritime Search and Rescue (SAR) in “Federal waters” (high seas, coastal, interstate rivers and lakes) and aeronautic SAR over the ocean environment.

The Department of Defense/U.S. Air Force is responsible for land SAR in the Continental U.S. and Alaska through the Air Force Rescue Coordination Center.

The Department of Interior/National Park Service – is responsible for SAR in national parks..

National Search and Rescue Committee

In 1954 under the direction of President Eisenhower, the Air Coordinating Committee released a report on Civil Aviation Policy indicating a need for the establishment of “...an overall search and rescue plan for effective utilization of all available facilities to include provisions for the control and coordination of all types of search and rescue missions.” This report however failed to identify a responsible entity with oversight for the administrative management of the plan.



During the National Search and Rescue Conference of 1973, conference participants recognized the administrative void and concluded that a permanent committee needed to be established in order to oversee the administrative safeguarding of the United States National Search and Rescue Plan and to act as a coordinating medium for discussions involving national SAR related matters. Acting upon the Conference conclusion, the Secretary of Transportation, under DOT order 1120.28 dated 21 May 1974, established through a written inter-agency agreement the Interagency Committee on Search and Rescue (ICSAR) to carry out the aforementioned functions.

The title name given to the inter-agency committee remained in effect from 1974 until a 1999 revision to the inter-agency cooperation agreement changed the committee's title name to the "National Search and Rescue Committee (NSARC)," which is the Committee's title today.

NSARC Documents

As part of its responsibilities for overseeing and coordinating U.S. interagency SAR matters, NSARC maintains several key SAR documents. These include:

- The U.S. National SAR Plan (NSP) – Coordinates SAR services to meet domestic needs and international commitments and assigns Fed SAR Coordinator (SC) responsibilities
- The National SAR Supplement (NSS) to the International Aeronautical and Maritime SAR Manual – Provides guidance to Federal Agencies on NSP implementation and provides guidance to all Federal forces, military and civilian, that support civil SAR operations
- The Catastrophic Incident SAR (CISAR) Addendum – provide guidance for SAR responders during the first 24-72 hours of a disaster and informs Federal Authorities and States what to expect of Federal SAR responders during CISAR incidents

Through the participation of NSARC members representing Federal SAR providers, the documents are created, revised and improved. They are accessible through the NSARC website at: www.uscg.mil/nsarc.

White House Report on Hurricane Katrina

The White House Report on Hurricane Katrina stated:

"The National SAR Committee should revise the National SAR Plan (NSP) to include disaster response operations."

It went on to say:

"The NRF references the NSP as a supporting operational document. However, the NSP is confusing because it specifically states that it does not cover overall response to disaster operations, as called for in the NRF. The NSP should therefore be revised to clarify its role in disaster response operations. The revisions should specifically address air traffic control and coordination."

As a result of this report, the CISAR Addendum was developed.



III. Catastrophic Incident SAR Addendum

OVERVIEW

“No notice” catastrophic incident SAR will initially be chaotic, no matter how well planned a response may be. Within minutes or hours of an event, Federal, State, tribal and local emergency responders will begin lifesaving operations. It must be assumed that although a coordinated response will not be implemented for at least 24-48 hours; lifesaving operations will continue regardless.

During a catastrophic incident Federal SAR responders support the State, unless otherwise directed that it is a Federal led response. Lifesaving is the most important aspect of any disaster response, but is usually an afterthought in planning. State, tribal and local responders need to plan for “no notice” events; in particular identify survivor drop-off and support/logistics locations.

The Catastrophic Incident Search and Rescue (CISAR) Addendum was created to provide guidance for SAR responders during the first 24-72 hours of a disaster. It provides a description of the Federal Government’s response in civil CISAR incidents.

The CISAR Addendum also informs other Federal Authorities involved in a CISAR response, and States what to expect of Federal SAR responders during CISAR incidents. The Addendum is guidance, not policy. It is being widely accepted though and adopted for State and local use. However, its primary intention is for use by CISAR responders.

CISAR Addendum (version 2.0): Topics

- Part I – Organization: - Key References
- Part II - Planning: Planning Considerations
- Part III - Operational Guidance

The CISAR Addendum continues to be marketed by NSARC member agencies to State, tribal and local responders through numerous venues. It is being incorporated by many States in their SAR plans. Version 2.0, developed based on lessons learned from recent responses, has been promulgated by NSARC Chair, to FEMA for inclusion in the National Response Framework..



IV. Conclusion

- This unit provided basic information about the U.S. National SAR System which defines the roles and responsibilities for SAR in the United States. The National Search and Rescue Committee oversees the National SAR Plan and coordinates interagency SAR matters. Finally, the Catastrophic Incident SAR Addendum provides guidance for all SAR responders during the first 24-72 hours of a disaster.



STUDENT MANUAL

DEFENSE SUPPORT BASIC SAR TRAINING

MODULE 2

UNIT 1: U.S. NATIONAL GRID

Unit Objective

Upon completion of this unit, participants will be able to understand and utilize the U.S. National Grid as a point reference system to identify locations and document required information.

Enabling Objectives

Successful participants will;

- Understand the importance of a single point reference system for all land SAR responders
- Understand and utilize the U.S. National Grid as a geo-referencing system for land SAR responders
- Understand how to identify specific locations on a map
- Understand how to report and document required point reference locations

V. Objectives



Unit Objective

Upon completion of this unit, participants will be able to understand and utilize the U.S. National Grid as a point reference system to identify locations and document required information.

Enabling Objectives

Successful participants will;

- Understand the importance of a single point reference system for all land SAR responders
- Understand and utilize the U.S. National Grid as a geo-referencing system for land SAR responders
- Understand how identify specific locations on a map
- Understand how to report and document required point reference locations

VI. The U.S. National Grid

Overview

- In the aftermath of Hurricane Katrina, the review of the Federal, State, tribal and local Search and Rescue (SAR) services response found that different SAR agencies used different methods to communicate geographic information, adding confusion and complexity to an extremely large scale SAR operation.
- A fundamental requirement for a geo-reference system is the ability to easily interface between the Incident Command System, the land, maritime, and aeronautical SAR responder. Each has unique geo-referencing requirements; effective interface between each component is vital to a successful Catastrophic Incident SAR response.
- No single map/chart projection or coordinate/grid system will be perfect for all applications. The conventions for locating points on the earth's surface for purposes of nautical and aeronautical navigation (long distances on small scale charts) is generally best conducted using latitude and longitude. Locating points on large-scale maps and for ground navigation is generally best accomplished with the United States National Grid (USNG). Large scale-maps can treat the Earth's surface as a plane – taking advantage of that simple geometric shape and math – rather than a complex sphere. Properly constructed large-scale maps – such as United States Geological Survey (USGS) topographic maps take curvature of the Earth into account.



- Per agreement by the National Search and Rescue Committee (NSARC) members (Department of Defense, Department of Homeland Security, Department of Interior, Department of Commerce, Department of Transportation, the National Aeronautics and Space Administration, and the Federal Communications Commission), the USNG geo-referencing scheme is to be used when a Catastrophic Incident is declared as outlined in the National Response Framework (January, 2008) which requires a interagency Federal SAR response.

“A catastrophic event is any natural or manmade incident, including terrorism, which results in extraordinary levels of mass casualties, damage, or disruption severely affecting the population, infrastructure, environment, economy, national morale, and/or government functions.”

- The USNG can also be used on a routine basis by Federal, State, tribal, local, and military SAR responders.

What is the U.S. National Grid?

- The USNG is an alpha-numeric-coordinate reference system based on the Universal Transverse Mercator (UTM) System and grid. This Federal Geographic Data Committee (FGDC) standard (FGDC-STD-011-2001) is based on the long established and internationally used Military Grid Reference System. The purpose of the USNG is to provide a seamless, standardized system of reference for nationwide use on large-scale maps and local areas. It is particularly suited for ground operations.
- The USNG provides a flexible alpha-numeric scheme to accommodate variable precision from tens of kilometers to one meter. For general field applications, a precision of one hundred-meters or ten-meters is typical (6 or 8-digit grids). Precision of up to one meter (10-digit grid) may be used when required. The USNG is depicted as a full fine line grid on maps. An example is the USGS 1:24,000-scale topographic maps where it is being implemented (Figure 1). Other example applications include street and other general purpose maps. For these maps the USNG serves as the universal map index.

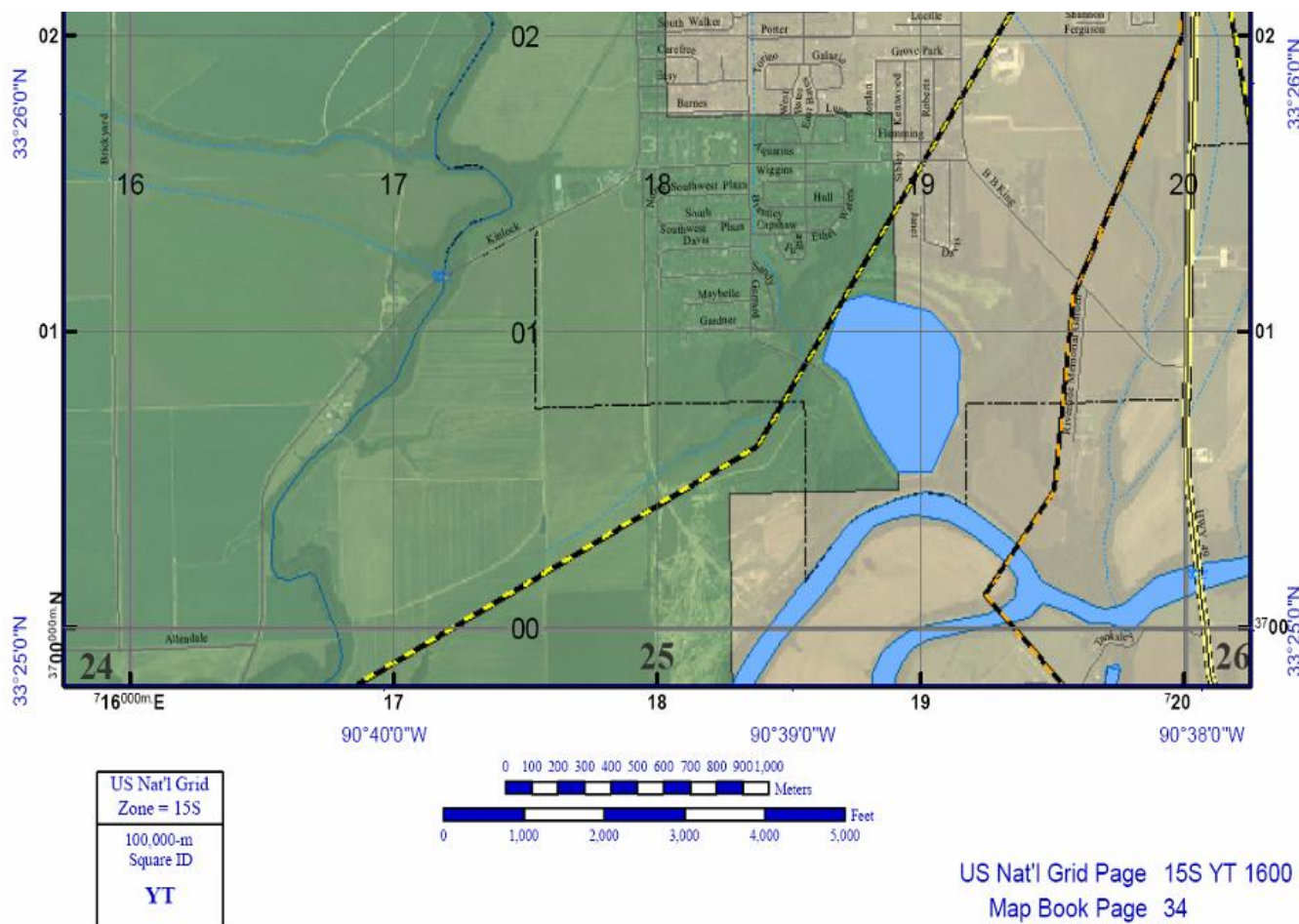


Figure1. Example of the U.S. National Grid on USGS 1:24,000

- Experience has shown that effective use of the USNG for obtaining precise locations on a map requires significantly less training time and ensures fewer mistakes than using latitude and longitude.
- The USNG is functionally equivalent to the Military Grid Reference System (MGRS) when referenced to NAD-83 or WGS-84 datums.
- NSARC has developed a geo-referencing policy to assist all SAR responders during a catastrophic search and rescue incident. Figure 2 provides cross reference information for SAR responders.



**Appendix I: National SAR Committee (NSARC)
Georeferencing Policy -
Catastrophic Incident Search and Rescue.**

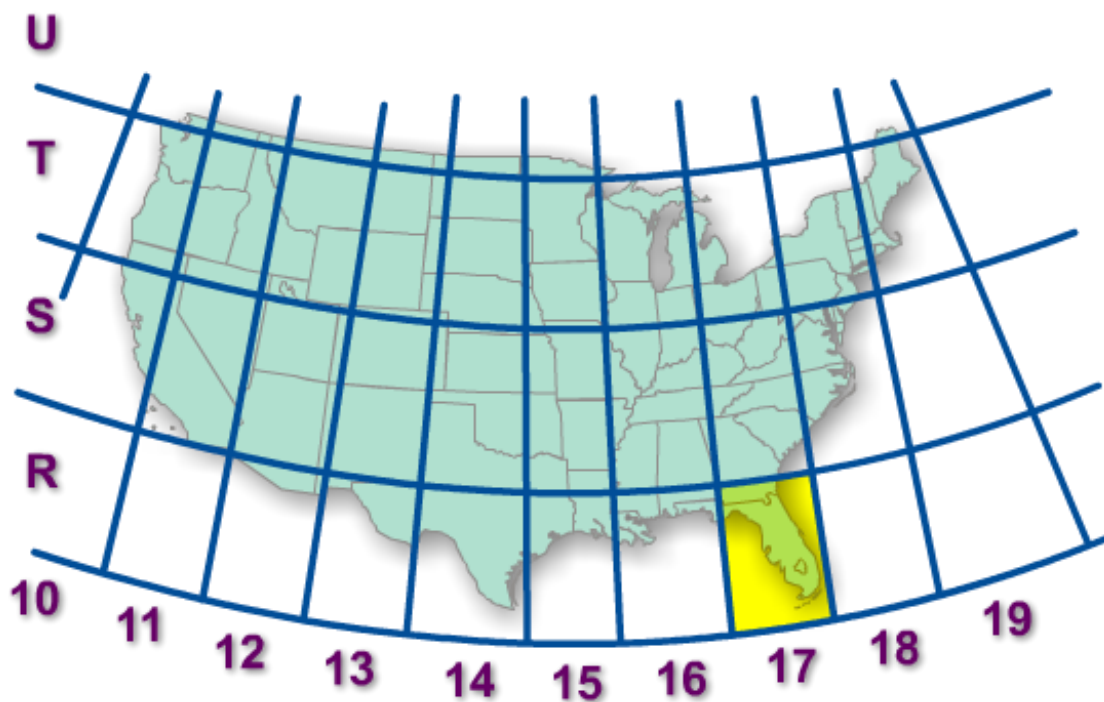
Georeference System User	USNG	Latitude/Longitude (DD-MM.mmm) (Note 1)	GARS-compatible
Land SAR Responder (Note 2)	Primary	Secondary	N/A
Aeronautical SAR Responders (Note 3)	Secondary	Primary	Tertiary
Airspace Deconfliction (Note 4)	N/A	Primary	N/A
Land SAR Responder/ Aeronautical SAR Responder Interface (Note 5)	Primary	Secondary	N/A
Incident Command: Air SAR Coordination	Secondary	Primary	N/A
Land SAR Coordination	Primary	Secondary	N/A
Geospatial information aggregation/dissemination (Note 6)	Tertiary	Secondary	Primary

Figure 2: Cross reference for geo-referencing by SAR responders



VII. Using the US National Grid

- USNG values have three components as seen below. The Grid Zone Designation gives a USNG value world-wide context with 60 longitudinal zones each 6° wide. Zones 10 - 19 cover the continental United States. UTM zones are divided into 8° latitudinal bands. Together these 6° zones and 8° bands compose Grid Zone Designations. Example: 17R
- In the northern hemisphere these start with the letter N at the equator and proceed consecutively northward in 8° increments (with the omission of the letter O).



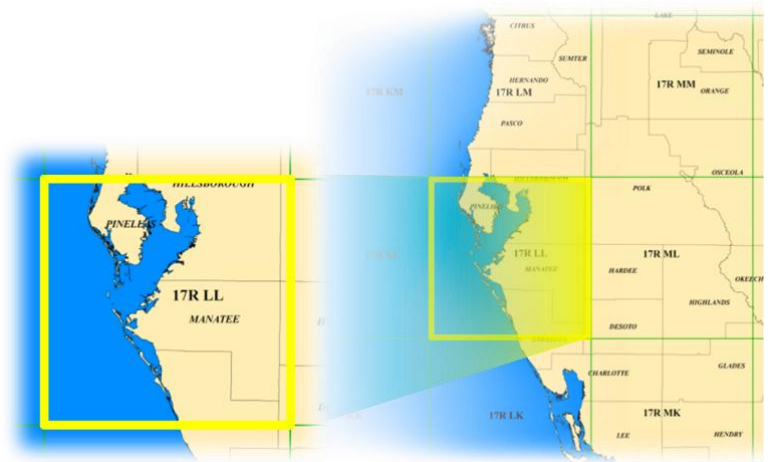
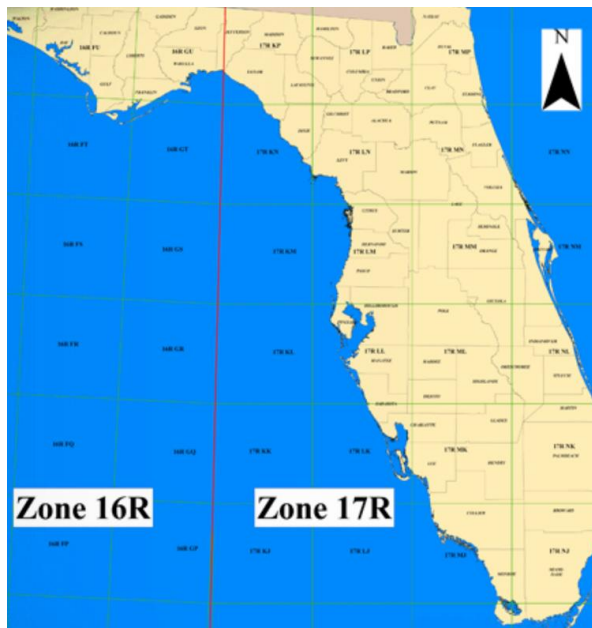
- Grid Zone Designations are further subdivided into 100-km x 100-km squares with 100,000-m Square Identifications. These squares are organized and lettered so they do not repeat themselves but every 18°, which is approximately 1,000 miles in the mid-latitudes.



Meter Square Identification

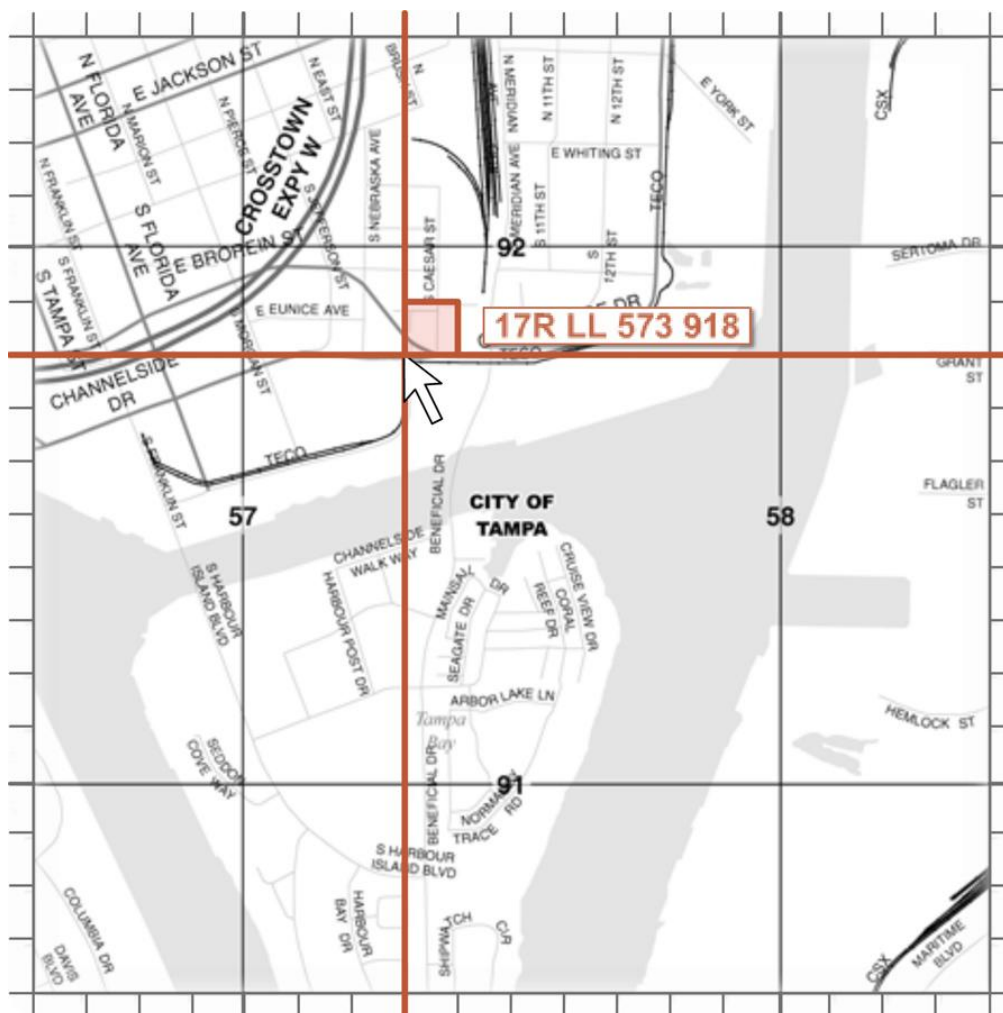
17R **LL** 573 918

The LL is the 100,000 Meter Square Identification for regional areas.



The 100,000-m Square Identification further broken down with grid coordinates. In the USNG coordinates **17R LL 573 918** the 573 918 are the coordinates of a specific location. The first set of numbers (573) is the Easting coordinates. The second set of numbers is the Northing coordinates. The grid system is always read left to right (Easting) and bottom to top (Northing). There should always be an even set of numbers for a proper grid coordinate. The more digits used the smaller the grid coordinates and the more accurate the location.

- **57 91** 4 digits locates the area within 1000 x 1000 meter square
- **573 918** 6 digits locates the area within 100 x 100 meter square
- **5732 9182** 8 digits locates the area within a 10 x 10 meter square
- **57323 91820** 10 digits locates the area within 1 x 1 meter square



Read Right Then Up

Once responders know where they are by GZD number and by 100,000 Meter Square, these numbers (e.g. 17R LL) can be dropped from radio communications, etc.

VIII. Conclusion

In the aftermath of Hurricane Katrina, the review of the SAR response found that different SAR agencies used different methods to communicate geographic information, adding confusion and complexity to an extremely large scale SAR operation. No single map grid system will be perfect for all applications, however, locating points on large-scale maps and for ground navigation is generally best accomplished with the United States National Grid (USNG). Per agreement by the National Search and Rescue Committee, the USNG geo-referencing scheme is to be used when a Catastrophic Incident is declared as outlined in the National Response Framework (January, 2008) which requires a interagency Federal SAR response..



STUDENT MANUAL

DEFENSE SUPPORT BASIC SAR TRAINING

MODULE 2

UNIT 2: SEARCH DEFINITIONS AND STANDARDS

Unit Objective

Upon completion of this unit, participants will be able to understand and utilize the search strategies and definitions necessary to accomplish the assigned search and rescue objectives.

Enabling Objectives

Successful participants will understand the:

- a. Standard search definitions
- b. Search modes
- c. Phases of disaster search operations



I. Objectives

Unit Objective

Upon completion of this unit, participants will be able to understand and utilize the search strategies and definitions necessary to accomplish the assigned search and rescue objectives.

Enabling Objectives

Successful participants will understand the:

- d. Standard search definitions
- e. Search modes
- f. Phases of disaster search operations

I. Definitions

The following definitions of search have become accepted standards for conducting disaster search operations. It is possible that the local Incident Commander may use different terms to define search strategies and tactics. For consistency and common operating language the following definitions are generally accepted:

Search Definitions

- g. **Reconnaissance (Recon)** is the preliminary survey of an affected area and/or assigned area of operation for the purpose of determining the scope and magnitude of the incident and identifying the resources needed to manage the incident. Other considerations for Recon include;
 - Initial and fast visual check of the damaged area and/or assigned area of operation
 - For single structure collapse incidents the primary purpose of this action is structural assessment and hazardous materials assessment
 - This can be accomplished by air, water craft, vehicles or walking
 - Known locations of survivors and/or victims will be recorded and appropriate evacuation/rescue resources will be called up
 - Size and make up of recon teams are incident driven and flexible
 - Recon teams should not engage in extrication/rescue operations
 - Timely reporting of information is critical to responders, survivors and effective management of the incident
- h. **Rapid Search (Hasty Search)** is a fast paced and methodical search of the assigned area of operation in an attempt to **locate survivors that are in immediate need of evacuation from harm**. Other considerations for Rapid Search include;
 - Can be accomplished by air, water craft or vehicles



- Size and make up of Rapid Search teams are incident driven and flexible
 - If survivors are located and can be easily evacuated they will be immediately removed and moved to the identified casualty collection point
 - If survivors are located and cannot be easily evacuated, additional resources will be called up to conduct extrication and or evacuation
 - Documentation of areas searched must be recorded and reported
 - This may be accomplished simultaneously with Recon.
- i. **Primary Search** is a quick search of the structures likely to contain survivors. These searches are ground or waterborne operations conducted by walking or boating around every structure in the assigned area of operations looking for survivors. This is accomplished by looking into every window/opening, knocking on doors and hailing for survivors. If there are signs of survivors and/or victims appropriate action will be taken based on the rules of engagement identified by the local Incident Commander. Other considerations for Primary Searches are;
- Primary Search is a well established fire ground/incident benchmark and as such is the stated objective until accomplished
 - Fast paced, quick scan of surface debris in and around structures and selected voids.
 - Size and makeup of the search team is incident specific driven and flexible
 - Detection resources may include physical, canine and technical
 - If survivors are located, additional resources are called up to extricate the survivor while the search team continues the identified objective to complete the Primary Search in the assigned area
 - Actions necessary to immediately correct life threatening injuries may be performed by this team
 - Survivor and/or victim locations will be marked with standard identification marking systems unless otherwise required by the local IC
- j. **Secondary Search** is the systematic search of every area of every structure in an assigned area of operation. Forced entry of structures may need to occur in order to accomplish this objective but will only be done with the authority of the local Incident Commander. This may involve extensive debris removal of building materials depending on the desired level of coverage and thoroughness. Secondary search can be divided in to two levels of coverage;
- a) **Low Coverage Secondary Search**
- 1) Systematic search of every room in every structure in the assigned area of operation
 - 2) Systematic search in and around every void space in the assigned area of operation
 - 3) Size and make up of search teams is incident driven and flexible
 - 4) Location/detection resources may include physical, canine and technical
 - 5) If survivors are located, additional resources may be called up to extricate the survivor while the search team continues with the identified objective to complete the Secondary Search in the assigned area



- 6) Survivor and/or victim locations will be marked with standard identification marking systems unless otherwise required by the local IC

b) High Coverage Secondary Search

- 1) Systematic and thorough search of every room in every structure in the assigned area of operation
- 2) Systematic and thorough search in and around every void space in the assigned area of operation. This will include complete de-layering and removal of collapsed debris to ensure thoroughness. This may include use of heavy equipment
- 3) Size and make up of search and extrication teams is incident driven and flexible
- 4) Location/detection resources may include physical, canine and technical
- 5) If survivors are located, additional resources may be called up to extricate the survivor while the search team continues with the identified objective to complete a Secondary Search in the assigned area
- 6) If victims are located, additional resources may be called up to extricate the victim(s) while the search team continues with the identified objective to complete the Secondary Search
- 7) Survivor and/or victim locations will be marked with standard identification marking systems unless otherwise required by the local IC

- k. **Special Response Team (SRT) Search** is a search employed when the IC has identified specific evacuation requirements necessary to limit loss of life for special needs individuals. Prior to an event such as a hurricane, emergency managers should be able to identify and prioritize facilities that sheltered in place. These facilities will likely have a significant number of survivors who may not be capable of providing for themselves if the event causes a complete disruption of services because of partial or complete collapse or rapid inundation of water. Search resources should be deployed to investigate these pre-identified facilities that are likely to require evacuation assistance. These facilities include but are not limited to;

- Hospitals
- Nursing Homes
- Evacuation Shelters
- Critical Infrastructure Facilities
- Areas of last refuge such as fire stations and police precincts

Note: These definitions may be modified by the AHJ and/or may be incident driven. Modifications must be clearly stated. Search definitions along with any modifications and Rules of Engagement must be made available to all team members assigned to the incident.



Other Definitions

- l. **Structural Collapse SAR** – Generally refers to operating in an area with collapse of large reinforced concrete structures.
- m. **Wide Area SAR** – Generally refers to operating in an area with a large number of structures spread over a wide geographic area. Structures are generally composed of single family homes and/or light commercial buildings with wood frame or unreinforced masonry construction.
- n. **Evacuation** - To move someone from a potentially endangered area, prior to being consumed by it. In other words - moving someone, who has the potential to be affected by a danger, out of its path (i.e., evacuate ahead of the storm, the fire, the tornado, the bomb etc.) so they are not directly harmed by it.
- o. **Extraction** - To lift someone out of or away from an involved area. In other words - removing someone from harm when they are in the middle of it (i.e., someone trapped on a cliff, someone in a contaminated environment, someone standing in front of an on-coming bus, etc.).
- p. **Extrication** - To set someone free from their entanglement. In other words - removing someone from debris or other objects (usually through labor and/or technical means).

IX. Search Modes

Generally speaking disaster search operations fall into two main categories.

- a. **Detection Mode** is the mode of search operations to determine if there are survivors present in a building or assigned area.
- b. **Location Mode** follows Detection Mode. If there is a reasonable degree of suspicion that survivors and/or victims may be present then searchers would then transition into the Location Mode of operation. In this mode searches deploy various strategies and tactics based on several factors the find the survivors and/or victims. Those factors include the;
 - The time of day the disaster occurred and the length of time since
 - Ambient conditions (light, temperature, humidity, noise)
 - Type of occupancy (school, apartment, office)
 - Available resources (K-9, technical search, trained personnel)
 - Local Incident Commander requirements



X. Search Operation Phases

Disaster search operations will go through several phases from the time the incident occurs until local authorities have met all their objectives and terminate response operations. Based on the time of arrival, search and rescue personnel may be in the early phases (survivor rescue) of the response or the later (victim recovery) phase of the operation. In the early phases the searchers may have to call for assistance for severely entrapped victims, large numbers of victims, or for locations where witnesses are sure there are trapped survivors but searchers just can't see much. The priority of the searchers is to find where people may be and not get locked into rescue operations. The five phases of search and rescue operations are identified below.

- a. **Phase One** is the "Damage Assessment" or "Recon" phase of the operation. First responders will be busy assessing the extent of damage in the affected area. Until survivors and/or victims are known to be present the responders will be operating in the detection mode. Phase one may be accomplished by a brief look, calling out, and obtaining information from witnesses.
- b. **Phase Two** is the phase of the operation when surface survivors are removed from danger and evacuated. Responders will be conducting assessments and "Rapid" or "Hasty" searches within their assigned area. They are trying to rapidly identify and assist as many survivors as possible while accomplishing their objective of conducting a Hasty Search of the assigned area.
- c. **Phase Three** consists of searching any accessible voids that may contain survivors. Search teams will assist trapped survivors that are easily reached without spending an unreasonable amount of time accessing and extricating a survivor if the assigned objective is primary searches. Depending on several factors such as type of construction (wood, concrete, steel) and resources available (K-9, technical search equipment) searchers will use various methods of detecting survivors.

If search teams find survivors and/or victims that will require more time and resources to rescue/recover they should note the location, notify appropriate personnel and continue with the assigned mission of primary search of all structures in the area of operation.

- d. **Phase Four** is the selected debris removal phase. Extended operations are required to extricate survivors. If searchers get positive indications of survivors that will require extended extrication during a primary or secondary search they will call for additional resources. The extent of entrapment and the type of material between the survivor and the rescuers will determine what will need to be removed, stabilized and/or cut through to access the survivor.

Phase four is typically later into operations. Recovery of human remains will need to be safely accomplished according to the Incident Commander requirements.

- e. **Phase Five** is the general debris removal phase of the response operations. It begins after the secondary searches are complete and the local Incident Commander has made the



determination that the survivability profile of those unaccounted for is very low. After all the known survivors have been removed and human remains detection is completed heavy equipment is brought in to begin the debris removal process.

XI. Conclusion

Understanding and utilizing the search strategies and standard definitions is necessary to accomplish the assigned search and rescue objectives.



STUDENT MANUAL

DEFENSE SUPPORT BASIC SAR TRAINING

MODULE 2

UNIT 3: SEARCH MARKING SYSTEMS

Unit Objective

Upon completion of this unit, participants will be able to understand and utilize standardized disaster search and rescue marking systems.

Enabling Objectives

Successful participants will understand and be capable of utilizing the follow standardized disaster marking systems:

- Grid and Block Marking System
- Structure Hazard Evaluation Marking System
- Structure/Hazard Marking System
- Victim Marking Systems



XII. Objectives

Unit Objective

Upon completion of this unit, participants will be able to understand and utilize standardized disaster search and rescue marking systems.

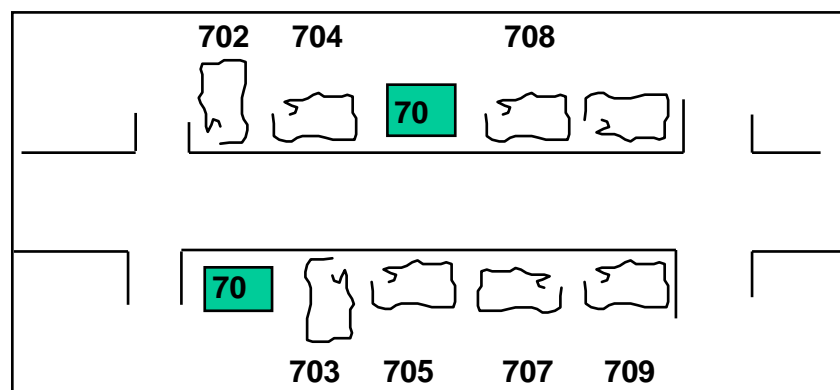
Enabling Objectives

Successful participants will understand and be capable of utilizing the follow standardized disaster marking systems:

- Grid and Block Marking System
- Structure Hazard Evaluation Marking System
- Structure/Hazard Marking System
- Victim Marking Systems

XIII. Grid and Block Marking Systems

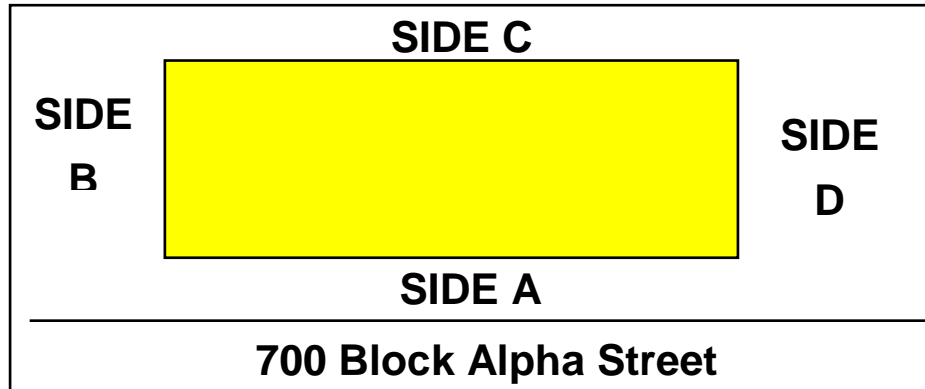
The US National grid has become the standard for establishing a reference point. When trying to identify a location on a map or document an important “find”, the USNG serves well as the required standard. At incidents involving several structures or large areas of damage, the identity and location of individual structures are crucial. The use of existing street names and addresses should always be considered first. However, if this is not possible due to damage, use the existing hundred block and place all even numbers on one side of the street and all odd numbers on the other side. Mark the new numbers on the front of the structure with orange spray paint. If due to damage the name of the street is not identifiable start with the letter “A” using the phonetic alphabet “Alpha”, “Bravo”, Charlie, etc. (see figure below)



- The 700 block of Alpha St.



Consistent with the standard grid and block marking system there is a standard reference system for the various sides and floor levels of the buildings themselves. As one stands on the street facing the structure that side of the building would be referred to as Side A. To the left of Side A is Side B and the rear of the building is called Side C (see figure below). Regardless of where the front door or the back door is, the street side of the building is referred to as Side A.



For a point of reference in multi-story structures most first responders refer to the ground level floor as Floor 1. The second story is referred to as Floor 2 and so on up the building. Basements and floors below the ground level floor are referred to as B-1 for the first floor below ground level and B-2 for the second floor below.

XIV. Structural Hazard Marking Systems

Structure hazards identified during initial size-up activities and throughout the incident should be noted. This Structure/Hazards Mark should be made on the outside of all normal entry points. Orange spray paint seems to be the most easily seen color on most backgrounds and line marking or downward spray cans apply the best paint marks. Lumber chalk or lumber crayons should be used to mark additional information inside the search mark itself because they are easier to write with than spray paint.

A large square box (approximately 2 ft x 2 ft) is outlined at any entrance accessible for entry into a compromised structure. Specific markings will be clearly made adjacent to the box to indicate the condition of the structure and any hazards found at the time of this assessment. Normally the square box marking would be made immediately adjacent to the entry point identified as safe. An arrow will be placed next to the box indicating the direction of the safe entrance if the Structure/Hazards marking must be made somewhat remote from the safe entrance.

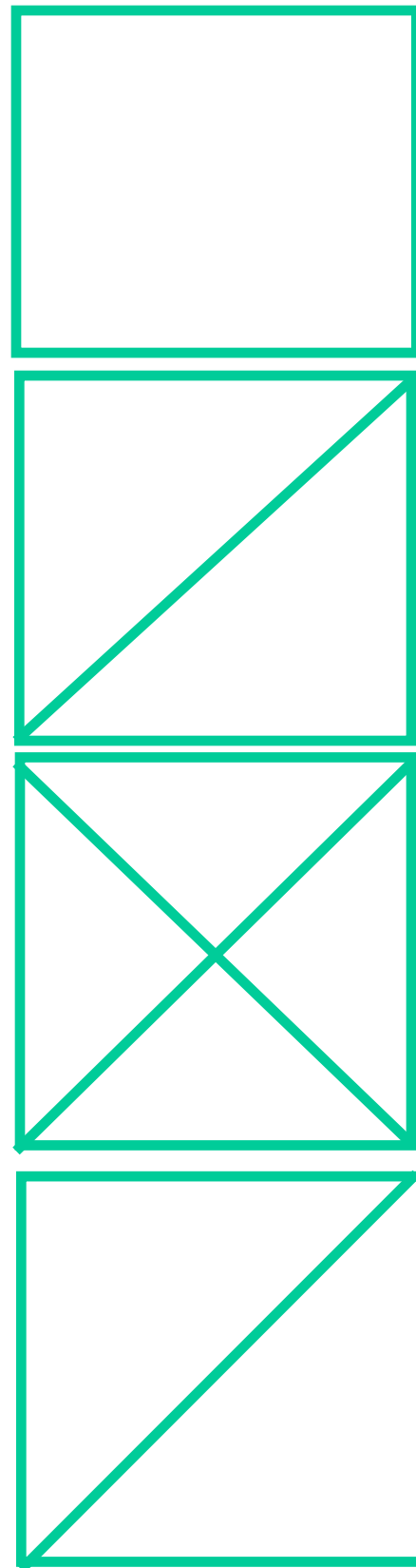


- The structure is relatively safe for S&R ops and there is little chance of further collapse.
 - Survivors could be trapped by contents.
 - Survivors could be unconscious.

- The structure is significantly damaged and some areas may be relatively safe, but others may need shoring, bracing, removal, and/or monitoring of hazards.
 - Building could be completely pancaked.

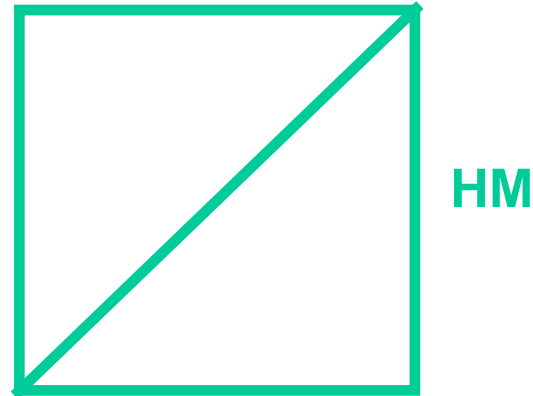
- The structure is NOT SAFE for search and rescue operations and may be subject to sudden collapse.
- Remote Search operations may proceed at significant risk.
- If search and rescue operations are undertaken, safe haven areas and rapid evacuation routes (with structure monitoring) should be created.

- An arrow next to the marking box indicates the direction of safest entry to the structure.





- HM indicates a hazardous material condition in or adjacent to the structure.
- Search and rescue operations normally will not be allowed until the condition is better defined or eliminated.



XV. Search Marking Systems

Search markings must be easy to make, easy to read, and easy to understand. To be easily seen, the search mark must be large and of a contrasting color to the background surface. Orange spray paint seems to be the most easily seen color on most backgrounds, and line marking or downward spray cans apply the best paint marks. A lumber marking device may be used to write additional information inside the search mark itself when it would be difficult to write the additional information with spray paint.

A large distinct marking will be made outside the main entrance of each building or structure searched. This “Main Entrance” search marking will be completed in two steps.

- First, a large (approximately 2 ft) single slash shall be made near the main entrance at the start of the search.
- After the search of the entire structure has been completed, a second large slash shall be made in the opposite direction forming an “X”.

Additional information will be placed in the remaining three quadrants of the Main Entrance “X” summarizing the entire search of the structure.

- Left Quadrant – will already contain the search team identifier, date, and time when the team first entered the structure.
- Top Quadrant – date and time the search team left the structure.
- Right Quadrant – any significant hazards located inside the structure.



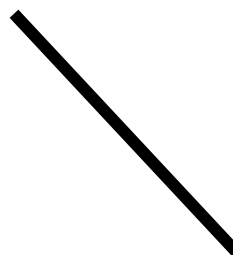
- Bottom Quadrant – number of survivors or victims **still inside** the structure. (“L” or “D” = LIVE or DEAD; small “x” = no survivors or victims.)

During the search function while inside the structure, a large single slash shall be made upon entry of each room or area. After the search of the room or area has been completed, a second large slash shall be drawn in the opposite direction forming an “X”.

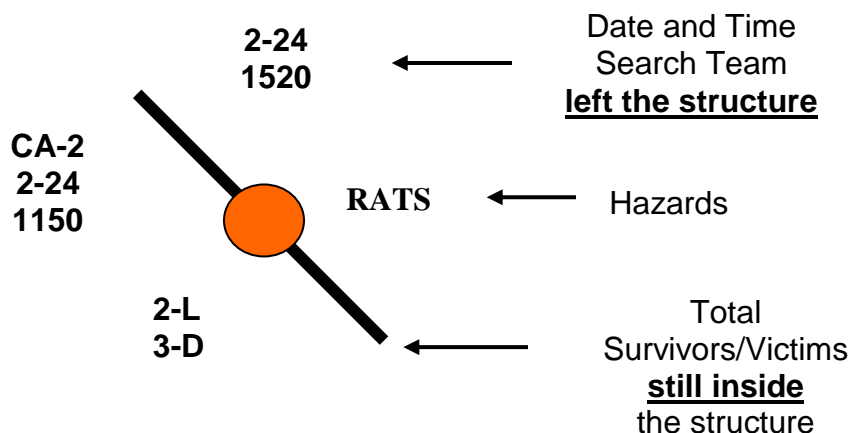
The only additional information placed in any of the “X” quadrants while inside the structure shall be that pertaining to any significant hazards or the number of “LIVE” or “DEAD”.

Main Entrance Search Marking **WHEN YOU ENTER**

* Search Team Identifier → **CA-2**
* Date of Entry → **2-24**
* Time of Entry → **1150**



Main Entrance Search Marking **WHEN YOU EXIT – INCOMPLETE SEARCH / NO ENTRY**



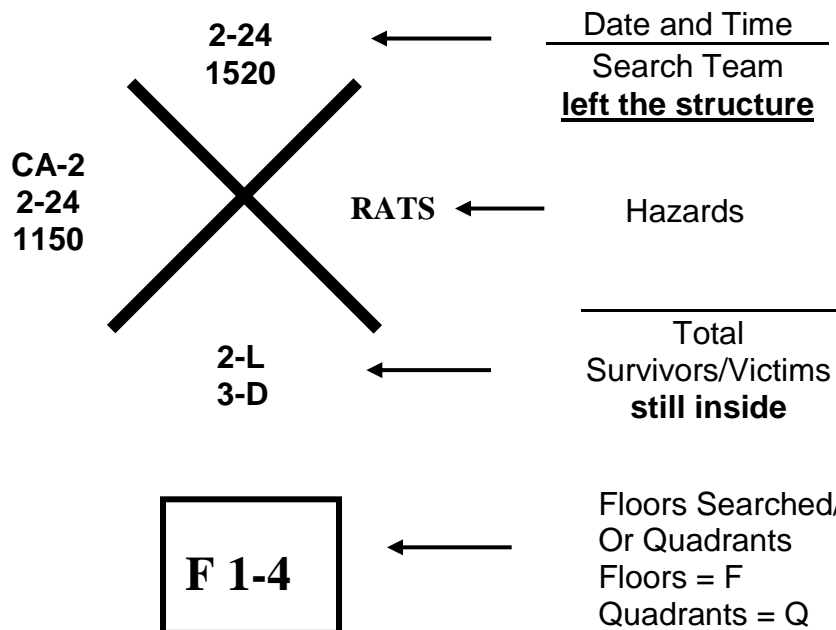


F 1-4

← Floors Searched/
Or Quadrants
Floors = F
Quadrants = Q

Main Entrance Search Marking

WHEN YOU EXIT – COMPLETED SEARCH

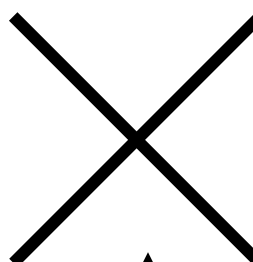
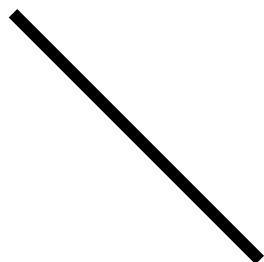




Interior Search Markings **EACH ROOM OR AREA**

WHEN YOU ENTER

WHEN YOU EXIT



←
**Identify
any
hazards**

↑
**Identify number of
any survivors/victims**

XVI. Victim Marking Systems

Make a large (2' x 2') "V" with orange spray paint near the location of a **potential** survivor and/or victim.

Mark the name of the Search Team or Crew identifier in the top part of the "V" with paint or a lumber marker type device. An arrow may need to be painted next to the "V" pointing towards the survivor and/or victim when the location is not immediately near where the "V" is painted.

Paint a circle around the "V" when a potential survivor is **confirmed** to be **alive** either visually, vocally, or hearing specific sounds that would indicate a high probability of a survivor. If more than one confirmed survivor, mark the total number of survivors under the "V".

Paint a horizontal line through the middle of the "V" when a **confirmed** victim is determined to be **deceased**. If more than one confirmed deceased victim, mark the total number of victims under the "V". Use both the live and deceased victim-marking symbols when combinations of survivors and victims are determined to be in the same location.

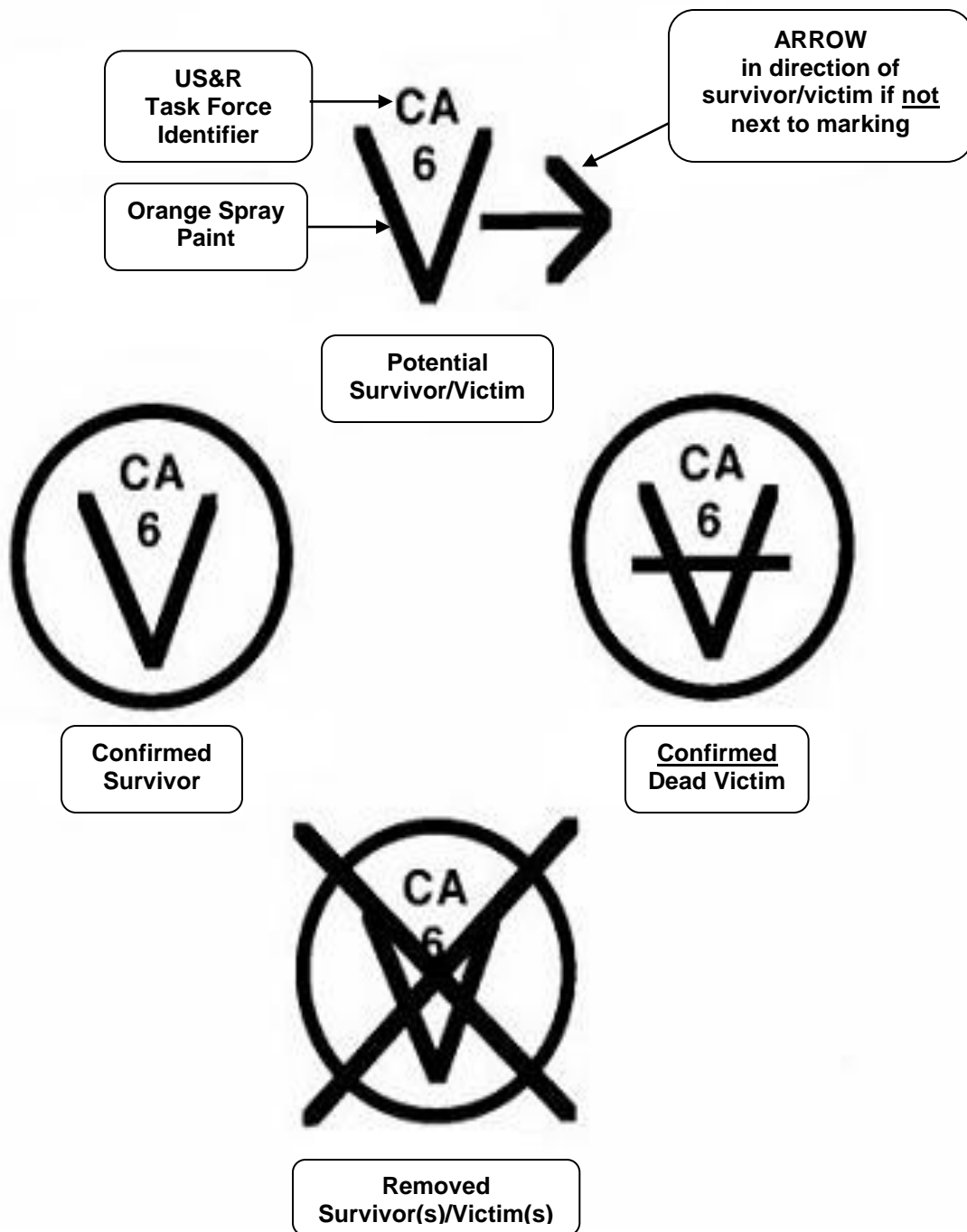
Paint an "X" through the confirmed victim symbol after **all** survivors and/ or victim(s) have been removed from the specific location identified by the marking.



FEMA

National Urban Search and Rescue Response System

Defense Support Basic SAR Training





XVII. Conclusion

SAR responders must have uniform standardized system for marking buildings or other structures to indicate the status of searched structures. Having a common search marking system reduces the possibility of redundant searches.



STUDENT MANUAL

DEFENSE SUPPORT BASIC SAR TRAINING

MODULE 3

UNIT 1: HAZARDS

Unit Objective

Upon completion of this unit, participants will be able to understand and recognize the hazards associated with operating at or near a disaster site.

Enabling Objectives

Successful participants will be capable recognizing existing and predictable hazards associated with disaster response operations and mitigating strategies to ensure safe operations including:

- Recognizing the physical hazards of the disaster site
- Understanding the chemical / atmospheric hazards present



XVIII. Objectives

Unit Objective

Upon completion of this unit, participants will be able to understand and recognize the hazards associated with operating at or near a disaster site.

Enabling Objectives

Successful participants will be capable recognizing existing and predictable hazards associated with disaster response operations and mitigating strategies to ensure safe operations including:

- Recognizing the physical hazards of the disaster site
- Understanding the chemical / atmospheric hazards present

XIX. Physical Hazards of Disaster Operations

The disaster site and surrounding areas are infested with hazards of all types. The fact that the local infrastructure and citizens have been severely impacted by the effects of the disaster causes conditions within the disaster area to be unsafe to work in. A good understanding of all of the existing and predictable hazards and how to protect you from them is the best defense against them. Responders can view the hazards associated with disaster response in two broad categories. The injuries created by the physical and atmospheric hazards at the disaster site can have long term effects and cause long term disabilities if not protected against.

The physical hazards present on or near the disaster site are all around the responder. The responder can look in any direction during the operation and see hazards present. At other times the disaster site worker will see the “accident waiting to happen.” Understanding how the disaster occurred gives a better understanding and recognition of the hazards that will be present. The following are examples of various physical hazards present at or near a disaster site.

Damaged Infrastructure

Depending on the cause of the disaster the local and surrounding infrastructure may be severely compromised. This may include transportation corridors, utilities and levees or dams. If the electrical grid is compromised traffic signals may not work properly thereby creating hazardous driving conditions in the area. Broken water, waste water or gas lines will present uncontrolled hazards until the problem is fixed.



If area dams or levees have been damaged the possibility of rapid inundation of water is high. Similar hazards can be found after heavy rainfall and local flooding. If responders are not trained and equipped properly the possibility of drowning exists. Broken utility lines can cause uncontrolled electrical hazards as well as the potential for a fire or explosion.

Engulfment / Entrapment

Engulfment and entrapment can occur to the unsuspecting responder. As discussed previously, rapid inundation of water could cause complete engulfment of an individual. Similarly, unsuspecting searchers could walk into an open pit, septic system, and underground storage tank. Depending on what is in those open spaces responders could be immediately engulfed by the contents.

Operating inside a partially collapsed structure is very dangerous work. The possibility of a partial or complete collapse is ever present. If proper hazard recognition and appropriate mitigation measures are not employed the collapse of the structure could entrap the searcher. Proper risk management considerations must be taken prior to and while operating in a collapsed structure.

Slip / Trip / Fall

Some of the most common industrial injuries reported every year are slip and trip related. Operating at a disaster increases the chance of injury associated with these hazards. Responders must literally watch every step they take to ensure their safety. Uneven and wet surfaces increase the risk of slipping. The debris typically scattered throughout the area present many opportunities for the responder to trip over all sorts of materials. And depending on how high the individual is above the ground the fall subsequent to the slip or trip could be fatal.

Among all the scattered debris will be many sharp objects that could cause serious injury to the disaster site worker. Simple things such as stepping on a nail or a cut caused by a sharp object can injure the unfortunate individual and cause serious enough injury to be taken out of service and sent to the hospital.

Energy Release

Release of stored energy is a serious threat to workers in industry. Unexpected releases of electricity kills many workers every year. The unexpected start up of machinery such as a conveyor belt system can and will cause serious traumatic injuries or death. The electrical system that was thought to be de-energized prior to entering a structure could cause electrocution of responders if the power was turned back on without notifying those in the area.

Additional possibilities of energy releases are that of steam, hydraulic fluid or a gas. Searchers must ensure all sources of energy are secured properly before commencing work in the structure.



Temperature Extremes

Very low or very high temperatures with high humidity can be hazardous to the responders as well as the survivors being searched for. Of the two temperature extremes the most challenging to work in is in a high temperature and high humidity environment. Heat stress, including heat cramps, heat exhaustion and heat stroke can cause serious injuries. The responder must be aware of the signs and symptoms of heat related problems.

Miscellaneous Hazards

Several other hazards are present when working in and around the disaster site. High noise levels can cause problems for the disaster responder. Aside from not being able to hear co-workers, long term exposure to excessive noise can have a serious impact on hearing later in life. OSHA mandates that workers operating in environments in excess of 85 decibels shall wear some type of hearing protection.

Low light conditions can be hazardous to responders. With damaged infrastructure, no street lights and no traffic lights conditions around the disaster site can be very hazardous. Without proper lighting the searcher can trip on objects or bump into unseen objects causing pain and sometimes penetrating injuries.

The very nature of the disaster impacted area will cause all creatures to seek refuge in a safe place. The possibility of encountering a hungry pack of dogs, vermins, vectors and other critters is ever present. Poisonous spiders and snakes should not be taken lightly by responders. Some are so poisonous as to cause death in a matter of minutes to the unfortunate victim of a snake bite.

XX. Chemical / Atmospheric Hazards of Disaster Operations

As with the physical hazards present in and around the impacted area chemical and atmospheric hazards will be present. Everything from the large scale release of liquid or gaseous chemicals to the mixture of household chemicals under the kitchen sink in a partially collapsed house can cause injury and/or death to the unsuspecting responder.

Responders must understand some basic information about chemical contamination. Responder should understand the routes of exposure chemicals can take into the body.

- Inhalation of a chemical vapor or gas can cause serious injury to the exposed individual. Depending on the chemical and the concentration of that material the resulting exposure could be considered a nuisance or life threatening injury.



- Ingestion of chemical hazards is generally thought of as a low possibility. The unintended swallowing of a suddenly released material could become a problem. Even more of a problem of ingestion of toxic materials while operating at a disaster is the ingestion that occurs when the responder did not wash his/her hands prior to eating a snack or a meal.
- Injection is another low probability route of exposure to some toxic substance. Being stuck by a rusty nail or sharp piece of dirty steel can cause penetration of the skin and the possibility of injecting the chemical substance into the skin, muscle or blood.
- Absorption of chemical hazards while working in an area impacted by disaster is another possibility. Absorption can occur by direct or indirect contact with the skin. If the responder comes in direct contact with a liquid chemical absorption of the chemical through the skin can occur. If the responder comes in close proximity to a chemical in the gaseous state, absorption through the skin can occur. The chemical in its gaseous state can come in contact with sweat on the skin. When the sweat evaporates exposure can occur as those contaminants are absorbed through the skin.

Chemical and atmospheric hazards generally fall into three broad categories. To ensure ones personal safety when operating at or near a disaster site the responder should have a good understanding of the atmospheric hazards present as well as the protective measures to ensure safe operation. A brief discussion of those atmospheric hazards should be sufficient for the intent of this training course.

Asphyxiating Atmospheres

Generally speaking this type of atmospheric hazard will not be found on most disaster sites. Asphyxiating atmospheres are those atmospheres that interfere with the body's ability to get the proper amount of oxygen necessary to sustain life. In some cases this may be caused by another chemical displacing the oxygen within a confined space thereby creating an oxygen deficient atmosphere for the searcher to breath. In other cases chemical atmospheres like hydrogen sulfide and carbon monoxide interfere with the body's ability to utilize available oxygen in the air.

Regardless of the cause, responders must be aware of the signs and symptoms associated with operating in an oxygen deficient or asphyxiating atmosphere. At the first sign of those associated signs responders must leave the area and call for hazardous materials professionals to qualify and quantify atmospheric conditions present.

Flammable Atmospheres

Many commonly found chemicals in industry and in the home of most Americans are flammable. Gasoline, paint thinner and other chemicals can cause a fire if an ignition source is presented. In some cases the presence of flammable liquids and gasses is easily detected by your smell of them. If this condition is present all attempts to ensure no ignition source is introduced



is very important for all personnel operating in the area. In other cases the presence of flammable atmospheres will not be readily noticeable. The unsuspecting responder could cause a fire or explosion by introducing an ignition source such as a cigarette lighter or electrical spark. The results could be catastrophic for those in the area.

Disaster searchers should also be aware of the fact that most flammable gasses and vapors are heavier than air. The absence of a noticeable smell where you are standing does not rule out the possibility of a flammable concentration of vapors in and around your feet. The searcher should suspect the presence of flammable and toxic vapors when entering a partially collapsed structure.

Toxic Atmospheres

Many chemicals manufactured in industry and found in homes and offices everywhere are toxic to the human body. Depending on the concentration of the liquid or vapors and the amount of exposure to the responder the toxic effects can range from mild irritation to sudden death. Responders should also understand that many chemicals are not toxic by themselves but mixed with another chemical during the disaster can cause a chemical reaction and serious health hazards. The simple mixing of the household cleaning products found under the kitchen sink in most houses is enough to cause vary hazardous atmospheric conditions inside the house. The unsuspecting searcher could be overcome by the toxic effects of those conditions with little warning. If in doubt responders should have hazardous materials professionals identify any such hazards present before work begins in that area.

XXI. Conclusion

As discussed earlier hazards can be found just about anywhere and in many forms at or near a disaster site. Responders must have a good understanding how normally safe day to day activities and situations can become hazardous after being impacted by a disaster. A good understanding of all of the existing and predictable hazards and how to protect you from them is the best defense against them. Looking for and recognizing those hazards allows the disaster site worker avoid the hazards or properly protect him/herself from the effects of that hazard.



STUDENT MANUAL

DEFENSE SUPPORT BASIC SAR TRAINING

MODULE 3

UNIT 2: HAZARD MITIGATION / PPE

Unit Objective

Upon completion of this unit, participants will be able to understand various hazard mitigation strategies and the appropriate personal protective equipment needed for operating at or near a disaster site.

Enabling Objectives

Successful participants will be capable of understanding hazard mitigation strategies as well as the use and limitations of personal protective equipment needed to ensure safe operations including:

- Avoidance measures to reduce the risk of exposure and injury
- Engineering controls as a hazard mitigation strategy to ensure safe operation
- Personal protective equipment necessary to protect from the existing and predictable hazards of disaster operation



XXII. Objectives

Unit Objective

Upon completion of this unit, participants will be able to understand various hazard mitigation strategies and the appropriate personal protective equipment needed for operating at or near a disaster site.

Enabling Objectives

Successful participants will be capable of understanding hazard mitigation strategies the appropriate personal protective equipment needed to ensure safe operations including:

- Avoidance measures to reduce the risk of exposure and injury
- Engineering controls as a hazard mitigation strategy to ensure safe operation
- Personal protective equipment necessary to protect from the existing and predictable hazards of disaster operation

XXIII. Hazard Avoidance Strategies

As stated in the previous unit the disaster site contains many hazards that fall into different categories. Based on the type of hazard and the degree of risk to the responder several hazard avoidance and mitigation strategies can be employed. In many cases responders will have to use multiple strategies to ensure their own personal safety and that of the survivors. Awareness and recognition of the hazard is always the best approach to managing them. If you understand the hazards present and look for them you will find them. Once those hazards are identified a plan for managing them can be implemented.

Avoidance measures are the simplest way of managing hazards in the area. When possible, responders can maintain a safe operating distance from the hazard to reduce their risk of injury. This will minimize their exposure to the particular hazard. Often times though avoidance is not possible. On a regular basis responders must work very near the hazard present and may become exposed to the ill effects of the hazard. If avoidance is not possible other strategies must be employed.

In some cases avoidance may be the simplest strategy but not necessarily the best strategy. In many situations on the scene of large scale disasters hazards are present and will be present until someone mitigates the hazard completely. Usually that should be done by the first person that recognizes the hazard. If the situation is a hazard to you it will be hazardous to the next person. If you cannot immediately mitigate it, mark it and let others know about it.



XXIV. Engineering Control Strategies

Engineering Controls will usually be the best mitigation strategy to protect responders from the hazards in the area. Examples of engineering controls are things like disconnecting the electricity, turning off machinery or shutting off the gas valve. After the system, building or machine is shut down it should be tagged with an appropriate device to alert others that it has been disconnected and consideration should be given prior to re-energizing the system or building.

In other situations engineering controls will involve the shoring and building stabilization necessary to ensure safe interior search and rescue operation. Or they may involve the use of positive or negative pressure ventilation to change the atmospheric conditions within a structure being searched. In some cases it is a simple matter of entirely removing the hazard. Simple things like removing the trip hazards in the base of operation or not letting the extension cord lay in a puddle of water are very effective in reducing the possibility for injuries. Regardless of the specific engineering control measures taken they are all designed to eliminate the hazard or render it incapable of causing harm.

XXV. Personal Protective Equipment

The use of personal protective equipment (PPE) is the last line of defense for a hazard mitigation strategy. A last resort for having to work in a hazardous environment or very near physical hazards is to protect oneself from those hazards by wearing the appropriate personal protective equipment. In some cases wearing PPE such as proper footwear, gloves and eye protection are a must at all times when operating at a disaster site. Approved hard hat helmets will be worn at all times if the possibility of objects falling is present or if there is a possibility of slipping and falling on uneven or wet surfaces. Hearing protection is often needed in and around the disaster site.

Respiratory Protection

The use of respiratory protection is situation dependent. If there is a good chance of an atmospheric hazard exposure to the responder then the appropriate level of protection must be worn while working in that area. At times the use of approved respirators is absolutely necessary to protect responders. In many situations almost everyone would agree about the need to wear a respirator. In many other situations the real need for wearing a respirator is put into question. The more appropriate question is regarding the type and concentration of the atmospheric hazard and the most appropriate respirator to properly protect the user. Understanding the use and limitations of the various levels of respiratory protection will help responders select the most appropriate respirator.



In most cases a N95 particulate air respirator is sufficient for search and extraction operations in and around the disaster site. When properly worn these provide protection against most (95%) particulates in the air. As was seen in many recent disasters the dust particulates such as concrete dust of silica have caused long term respiratory problems for those that did not wear the proper protection. Responders must be aware of the fact that this type of respirator becomes inefficient after short periods of time working in a high particulate and high humidity environment. This type of respirator does not filter out toxic vapors and is useless in an oxygen deficient atmosphere.

If protection from low levels of toxic atmospheres is necessary a higher level of respiratory protection will be required to ensure the safety of the responder. Air purifying respirators provide a higher level of protection for the user. These half-faced and full-faced respirators are considered to be negative pressure type. As such there can be a significant level of physiological stress associated with wearing an APR for an extended period of time. If the filter medium is clogged due to moisture and particulates the user has to work harder to breath in good clean air. After short periods of time the muscles used for breathing can become fatigued and cause more problems for the user. As with the chemical protective clothing the stress created by wearing this type of PPE must be weighed against the hazards being protected from.

If atmospheric conditions in the work area are very hazardous and not able to be mitigated by ventilation or some other engineering control responders will be required to wear a higher level of respiratory protection such as a Powered Air Purifying Respirator (PAPR) or a Self Contained Breathing Apparatus (SCBA). These two types of respirators are considered to be positive pressure respirators. With a PAPR the air is supplied by the fan within the device through the filters and into the users mask. With an SCBA the air is delivered from the bottle worn on the users back to the face piece. Provided the SCBA bottle was filled with Grade D air the user will get a continuous supply of clean air to breath until the all the air in the bottle has been used. Generally speaking most disaster workers will not need this level of respiratory protection. If the atmospheric conditions are such that an SCBA is necessary serious thought needs to be given to the status of the survivors we are trying to save and the health and safety of responders.

Skin Contact Protection

If the possibility exists for cuts, scratches or other skin punctures then responders should consider the use of long sleeve, durable outer wear. As seen with respiratory protection there are various levels of skin contact protection based on their capability to protect the user from the present hazards. Similarly as the Mission Oriented Protective Posture (MOPP) levels of protection civilian responders have the same identified levels of protection. Based on the known or suspected hazard the proper level of protection must be worn when working in the contaminated area. Protective levels A thru D provide the appropriate garment and respirator to protect the user from the identified hazards. Based on current MOPP protocols the civilian equivalent would be MOPP Level 0 is similar to Level D protection. MOPP Level 4 being similar to Level A protection. The graphic below demonstrates the different MOPP levels.



STANDARDIZED MOPP LEVELS



MOPP Level	0	1	2	3	4
Overgarments	readily available	worn*	worn*	worn*	worn
Overboots	readily available	carried	worn	worn	worn
Gloves	readily available	carried	carried	carried	worn
Mask/Hood		carried	carried	worn*	worn
Mask	carried				

*In hot weather, the jacket or hood can be left open for ventilation.

Responders should always consider the trade off of wearing various levels of PPE garments. One must be aware of the physiologic stress to the body caused by wearing those garments and the real hazard threats they are actually present. On a 100 degree day with 95 percent humidity the physiologic stress and hazard of wearing chemical protective clothing may be greater than the chemical hazards present in the area.

XXVI. Conclusion

As stated previously there will be hazards all over the disaster site. Responders must be capable of recognizing existing and predictable hazards in the area. When avoidance and engineering controls alone can control the hazards in the work area personal protective equipment must be worn. Based on the respiratory hazards in the area the appropriate level of respiratory protection shall be worn in the hazard zone. When physical or atmospheric hazards that can penetrate or be absorbed into the skin are present the appropriate level of protective garment shall be worn by all those operating in the hazard zone. Understanding when to wear and what level of protection to wear to best protect from the present hazards is a constantly changing situation in a disaster. Being cognizant of all the factors related to wearing PPE is the best defense against all the hazards at a disaster site.



STUDENT MANUAL
DEFENSE SUPPORT BASIC SAR TRAINING
MODULE 4
COURSE SUMMARY

I. Course Summary

- The Defense Support Basic SAR Training defines the scope of work related to a request to the Department of Defense and/or National Guard Bureau to support FEMA's response to a catastrophic incident.
- This course is designed to clearly articulate civil SAR procedures including the use of the USNG, search definitions, standards and marking systems, for the DoD personnel working under a unified command. It is also designed to help DoD personnel understand the hazards of the disaster environment as well as mitigation strategies for ensuring the safety of all personnel operating at a disaster site.
- Responding DoD personnel will provide a force multiplier that will greatly enhance the resources necessary to carry out technical search, rescue and extraction operations over greatly expanded areas of devastation and directly contribute to the reduction in lives loss.
- The Defense Support Basic SAR Training, though designed to be brief, and easily delivered, ensures continuity of operations toward effectively assisting survivors of a disaster of catastrophic proportion.